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Comparative study and physico-chemical analysis of kinnersani, palair and wyra reservoir waters of khammam, Telangana, India

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ABSTRACT

In order to determine the water quality, samples of water collected from Kinnersani, Palair and Wyra reservoirs of Khammam district, it was collected in acid wash bottles in early hours. Physico–chemical analysis different parameters were analyzed like PH, Turbidity (NTU), Electrical Conductivity (micro mhos), Total dissolved Solids (mg/l) Chloride (mg/l), Sulphate (mg/l), Nitrate (mg/l), total Alkalinity (mg/l), total Hardness (mg/l), Calcium (mg/l), Fluoride (mg/l), Iron (mg/l). Each parameter was compared with the standard desirable limits of different agencies like BSI (Bureau of Indian standards), WHO (World Health Organization) standards. In this Kinnersani, Wyra, Palair reservoirs best and within the limitations of results are shown by Kinnersani reservoir.

Keywords: Physico chemical analysis, Kinnersani, Palair, Wyra Reservoirs.

1. INTRODUCTION

Water is life. No life can exist without water. Water resources are critical importance to both natural ecosystem and human development. Water is a most important renewable natural resource which plays an important role in the survival of living organisms. It is a vital factor of life and it is considered as precious compound on the earth (Mohammad et al., 2017).

Water is one of the most important natural resources available in abundant in nature which man has exploited more than any other resource for the sustenance of life. Basic feature of the earth is in abundance of water resources. It has been estimated that 0.00192% of the total water on the earth's planet is available for human consumption (Trivedy and Goel, 1984). Fresh water is an important need to the human being and is considered as the "elixir of life". The industrialization, urbanization, over population growth and consequent pollution let into the fresh water resources, are a challenge for the fragile fresh water ecosystem. The ability of fresh water bodies to clean themselves has affected by the major quantity of waste generated by ever growth of population (Ghosh, 1992).

The population in India is to expected to stabilize around 1640 million by the year 2050, as a result, gross per capita water availability will declaim from 1820 m3 in 2001 to as low as ~1140m^3/ Year in 2050 thus the growing concern about water scarcity challenges us to think of alternative solutions to avoid the current problem of water scarcity (Mohammad et al., 2017). Water quality monitoring is of immense importance in conservation of water resources for fisheries, water supply and other activities; it involves the assessment of Physico - chemical parameters of water (John Mohammad and Krishna, 2014).

Review of literature

The Physico-chemical characteristics of water were studied by Jain and Dhamija, (2000); Bahura, (2001); Altaff & Muthupriya, (2002); Anitha and Kumar, (2003); Manna and Das, (2004); Mathew Koshey, (2005); Saritha et al., (2009); Mullar et al., (2010), Joshi and Patel, (2012).

2. MATERIALS & METHODS

Study area

To evaluate the water quality an effort was made to investigate the waters of Kinnersani, Palair and Wyra, reservoirs of Khammam district, Telangana, India. Description Kinnersani, Palair, Wyra reservoirs are given **(**Mohammad, 2015). Reservoirs the region gets much rain fall from south west monsoon. In generally the place gets most of rainfall from June to September during the monsoon highest rainfall observed in the months of June.

Description of Kinnersani Reservoir

Village	: Yanamboil
Mandal	: Palvancha
Distance from Khammam	: 95Kms
Purpose of reservoir	: Irrigation, fish culture, Electricity Generation, drinking water.
Latitudes	: 17^o-68′-41′ N
Longitudes	: 80^o-66′-11′ E
Water basin	: Godavari
Full reservoir level	: + 124.05 Metres
Maximum water level	: +124.66 Metres
Maximum height of the Dam	: 38 Metres
Catchment area	: 1333.33 Sq. Mts.
Average rainfall	: 863.55 mm

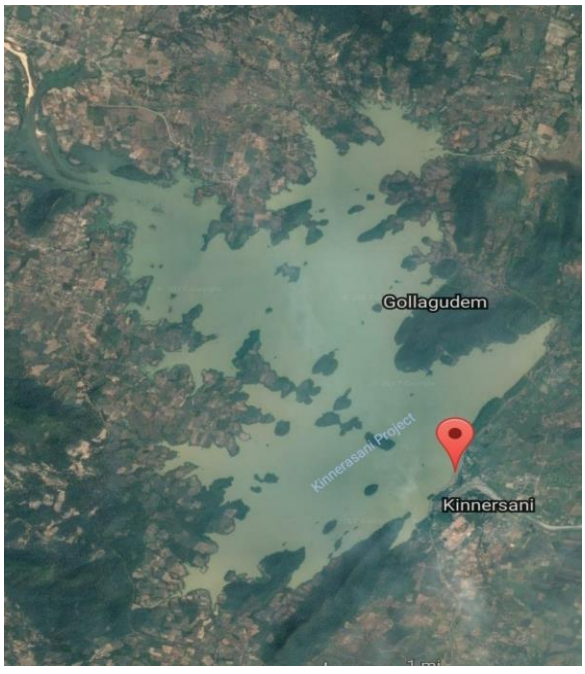

Figure 1 Google map of Kinnersani Reservoir

Description of Palair Reservoir

Village	: Palair
Mandal	: Kusmanchi
Distance from Khammam	: 23 Kms
Purpose of reservoir	: Irrigation, fish culture, Electricity Generation
Latitudes	: 17^{o}-12′-12′ N
Longitudes	: 79^{o}-54′-10′ E
Water basin	: Krishna
Full reservoir level	: + 439.310 Metres
Maximum water level	: +444.310 Metres
Maximum height of the Dam	: 20.57 Metres
Catchment area	: 651.24 Sq. Mts.
Average rainfall	: 790 mm

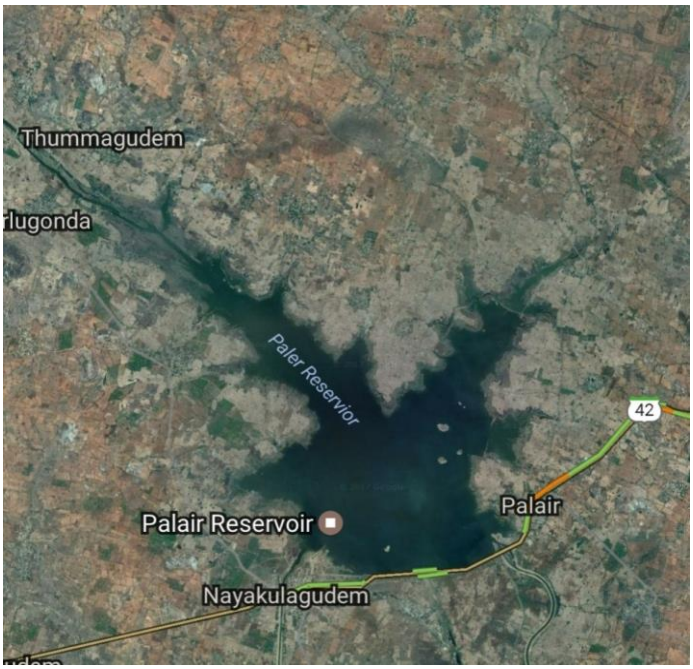

Figure 2 Google map of Palair Reservoir

Description of Wyra Reservoir

Village	: Wyra
Mandal	: Wyra
Distance from Khammam	: 25 Kms
Purpose of tank	: Irrigation, fish culture, drinking, Recreation.
Latitudes	: 17^{o}-11′-45″ N
Longitudes	: 80^{o}-22′-30″ E
Water basin	: Krishna
Full reservoir level	: +314.20 Metres
Maximum water level	: +320.20 Metres
Maximum height of the Dam	: 26.83 Metres
Catchment area	: 19.14 Sq.Metres
Average rainfall	: 793.06 mm

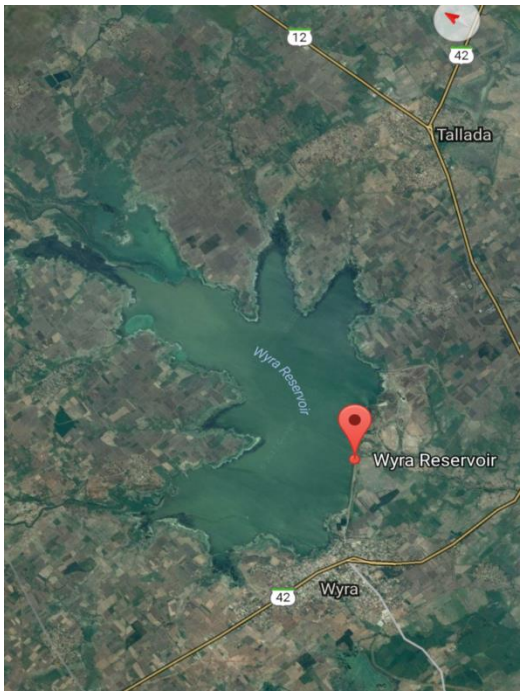

Figure 3 Google map of Wyra Reservoir

Collection of Sample

Table 1 Water Parameters & Analysis Methods

S.NO	PARAMETER	Units	METHOD FOLLOWED
1	P^H	-	Electrometric P^H meter
2	Turbidity	NTU	Nephelometric Method
3	Electrical Conductivity	Micro mhos	Conductivity meter
4	TDS	Mg/l	EC X 0.456
5	Chloride	Mg/l	Argent metric Method
6	Sulphate	Mg/l	Turbid metric Method
7	Nitrate	Mg/l	Ultraviolet Spectrophoyometric Method
8	Total Alkalinity	Mg/l	Titration Method
9	Total Hardness	Mg/l	EDTA- Titration Method
10	Calcium	Mg/l	EDTA- Titration Method
11	Fluoride	Mg/l	Spectrophotometer
12	Iron	Mg/l	Phenanthroline Method

3. RESULTS & DISCUSSION

In order to determine the water quality, samples of water collected from Kinnerasani, Palair, and Wyra reservoirs of Khammam district was collected in acid wash bottles. Physico –chemical analysis different parameters were analyzed like PH, Turbidity (NTU), Electrical Conductivity(micro mhos), Total dissolved Solids (mg/l) Chloride (mg/l), Sulphate (mg/l), Nitrate(mg/l), Total Alkalinity (mg/l), Total Hardness (mg/l), Calcium (mg/l), Fluoride (mg/l), Iron (mg/l).Each parameter was compared with the standard desirable limits of different agencies like BSI, WHO standards.

Table 2 Water Parameters &Analysis Results

S.No	Name of the sample	Place	PH	Turbidity	EC	TDS	Chlorides	Sulphates	Nitrates	Alkalinity	Total hardness	Calcium	Fluoride	Iron
1	Sample R1	Kinner	8.38	5.2	542	350	57	71.8	2	200	132	80	0.21	0.21

		asani												
2	Sample R2	Palair	8.26	0.1	1850	1193	359	70	7.2	368	432	172	0.1	0.24
3	Sample R3	Wyra	7.53	20.5	651	420	111	32.4	0.3	264	200	104	0.41	0.24

Table 3 Physico-chemical parameters assessment of ground water in urban area of Khammam, Telangana

S.No	Parameters	Range	BIS	WHO	MEAN
1	PH	7.53-8.38	6.5-8.5	6.5-8.5	8.06
2.	Turbidity	0.1-20.5	5-10 NTU	-	
3.	Electrical Conductivity	542-1850	1500 mmhos	1500 mmhos	1014
4.	TDS	350-1193	500 mg/l	500	654.33
5.	Chloride	57-359	250 mg/l	250 mg/l	175.67
6.	Sulphate	32.4-71.8	200-400 mg/l	500mg/l	
7.	Nitrate	0.3-7.2	45-100 mg/l	500 mg/l	
8.	Total Alkalinity	200-368	200 mg/l	200 mg/l	277.33
9.	Total Hardness	132-432	300-600mg/l	------	
10.	Calcium	80-172	75-200	-----	118.67
11.	Fluoride	0.1-0.41	1-1.5mg/l	1.5 mg/l	
12.	Iron	0.21-0.24	0.3-1.0 mg/l	------	

Source BIS, WHO Standards, Mohammad et al., (2015), Physico-chemical parameters assessment of ground water in urban area of Khammam, Telangana.

Physico- chemical analysis of Water

The Physico- chemical analysis of water is the prime considerations to access the water quality for its best utilization like drinking, irrigation (Mohammad et al., 2017). In the present study from Kinnersani, Palair, Wyra reservoirs total 12 parameters ware assessed and its comparison of variations individual parameters was showed in (Figure 4-Figure 15).

P^H

The PH is defined as the intensity of the acidic or basic character of solution at given temperature. It is a most important chemical factor of water, it is considered as important ecological factor of aquatic ecosystem (Mohammad and Srujan, 2016). In the present study P^H range is in 7.53-8.38, in all reservoirs P^H is in within the limits.

Turbidity

Turbidity is an expression of light scattering and light absorbing property of water and is caused by the presence of suspended particles such as clay, silt and colloidal organic particles. Higher turbidity is known to affect the primary productivity by restricting the light penetration and photosynthesis (Kodarkar and Chandrasekhar, 1995). In the present study three reservoirs turbidity range is 0.1-20.5 (NTU), in this highest turbidity was shown by Wyra reservoir it may due to low density and runoff water from paddy fields.

Electrical Conductivity

The electrical conductivity of water depends up on ions present in water. It reflects the nutrient status of water and distribution of macrophytes (Gupte, 1996). In present study three reservoirs water analysis of Electrical conductivity results are in the range of 542-1850 (mg/l), in this present study high range of Electrical conductivity is shown by Palair reservoir.

TDS (Total Dissolved Solids)

Total dissolved solids do not contain gases or the colloids, but consist of molecules and ions that are present as true solution in water. In natural waters, total dissolved solids are normally composed of salts of carbonates, bicarbonates, chlorides, sulphates and elements like silica, calcium, magnesium, sodium and potassium which confirm degree of hardness in water (Toran, 1987). In present study three reservoirs water analysis of Total dissolved Solids results are in the range of 350-1193 (mg/l); in this present study high range of Total dissolved solids are shown by Palair reservoir.

Chloride

Chloride is one of the most important anion, which determines the total salinity of water. High chloride content in freshwater can be due to excessive evaporation and non-replenishment of the water loss through rainfall (Dwivedi and Pandey, 2002). In present study water analysis of three reservoirs chlorides results are in the range of 57-359 (mg/l), in this present study high range of Chlorides' are shown by Palair reservoir.

Sulphate

Sulphide oxidation in a carbonate environment produces ground water contamination with high sulphate making the water unsuitable for drinking supplies (Tebbut, 1974). In present study reservoir water analysis of three reservoirs Sulphates results are in the range of 32.4-71.8 (mg/l), all the reservoirs are within the standards.

Nitrate

Higher concentration of nitrate is an indicator of organic pollution and eutrophication (Dass and Mohammad, 2015). In present study three reservoir water analyses of Nitrates results are in the range of 0.3-7.2 (mg/l), all the reservoirs Nitrate results are within the standards.

Total Alkalinity

Alkalinity in natural waters is formed due to dissolution of CO_2 in water or HCO_3 produced by the action of ground water on limestone or chalk. Alkalinity provides buffering to resist change in P^H (Mahajan and Billore, 2014). In present study three reservoir water analysis of Total alkalinity results are in the range of 200-368 (mg/l), In the present study Palair, Wyra reservoirs Total alkalinity ranges are more than the standards of BIS, WHO.

Total Hardness

The total hardness of water causing ions in water is mainly calcium and magnesium is the measure of the capacity of water to react with soap (Mohammad, 2015). In present study three reservoirs water analysis of Total hardness results are in the range of 132-432 (mg/l), in present study all the reservoirs Total hardness results are within the standards of BIS, WHO.

Calcium

Calcium is exacerbated through leaching lime stone, Dolomite, Gypsum and Gypsiferous state WHO, 1996. The presence of calcium and magnesium along with their carbonates, sulphates and chlorides make the water hard. In present study water analysis of three reservoirs Calcium results are in the range of 80-172 (mg/l), in present study all the reservoirs Calcium results are within the standards of BIS, WHO.

Fluoride

Traces of fluorides occur in many waters and higher concentration often associated with underground sources. Most of the waters contain below 1 mg/l. It effectively reduces dental caries without any adverse effect on health. Fluor sis may occur when fluoride level exceed the recommended limits. In present study three reservoirs water analysis of fluoride results are in the range of in present study all the reservoirs Fluoride results are within the standards of BIS, WHO.

Iron

Iron is the second most abundant metal in the earth's crust, of which it accounts for about 55 elemental Iron is rarely found in nature, as the iron Fe^{2+} and Fe^{3+}. The common source of Iron in ground water naturally occurring from weathering of iron bearing minerals and rocks, industrial effluent, acid mine drainage, Sewage. In present study three reservoirs water analysis Iron results are in the range of 0.21-0.24 (mg/l), in this present study Iron results are within the limitations standards of BIS, WHO.

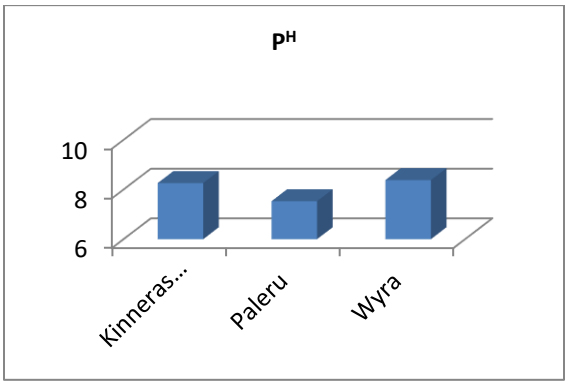

Figure 4 Comparison of variations of P^H in three study reservoirs

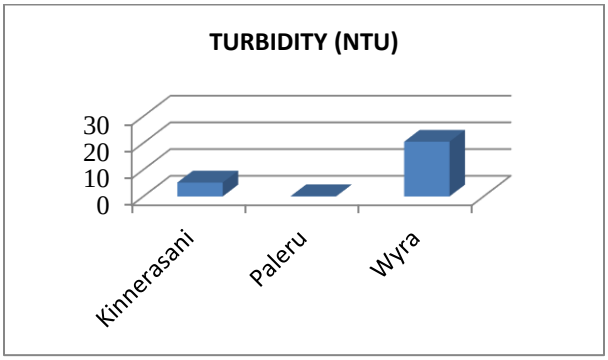

Figure 5 Comparison of variations of Turbidity (NTU) in three study reservoirs

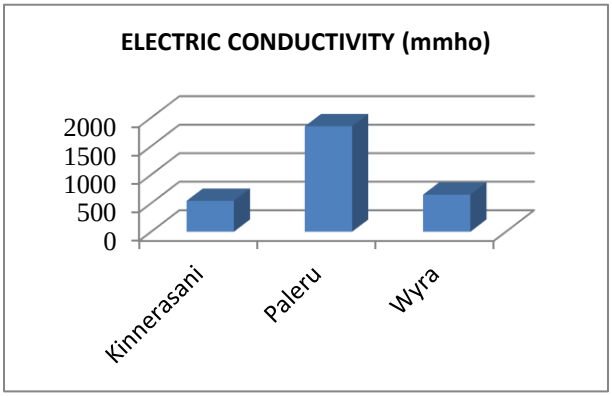

Figure 6 Comparison of variations of Electrical Conductivity (micro mhos) in three study reservoirs

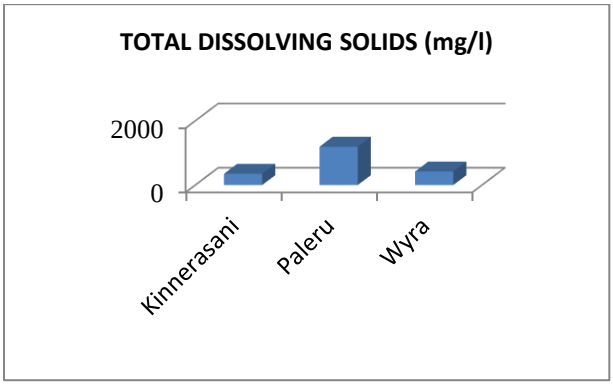

Figure 7 Comparison of variations of Total Dissolved Solids (mg/l) in three study reservoirs

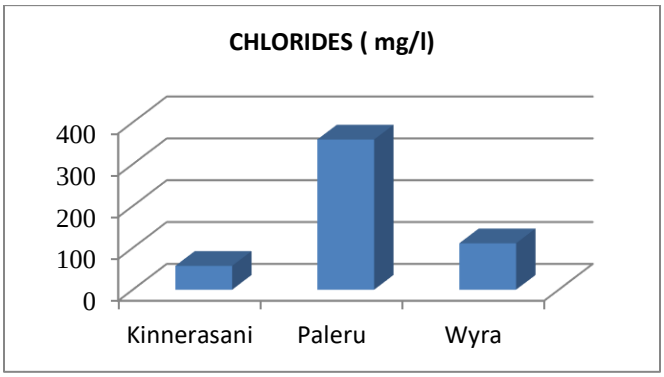

Figure 8 Comparison of variations of Chlorides (mg/l) in three study reservoirs

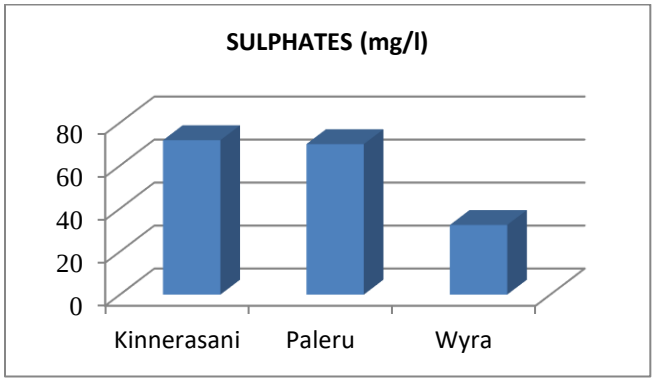

Figure 9 Comparison of variations of Sulphates (mg/l) in three study reservoirs

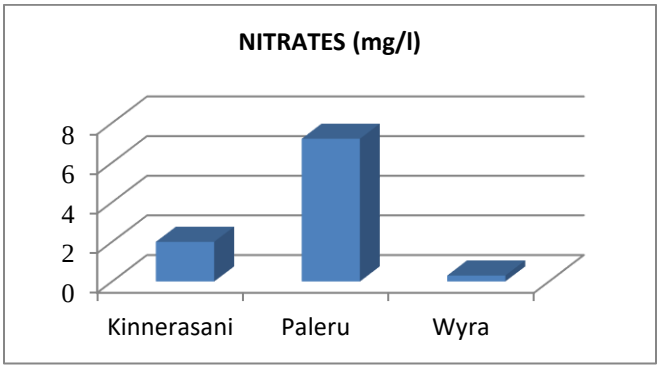

Figure 10 Comparison of variations of Nitrates (mg/l) in three study reservoirs

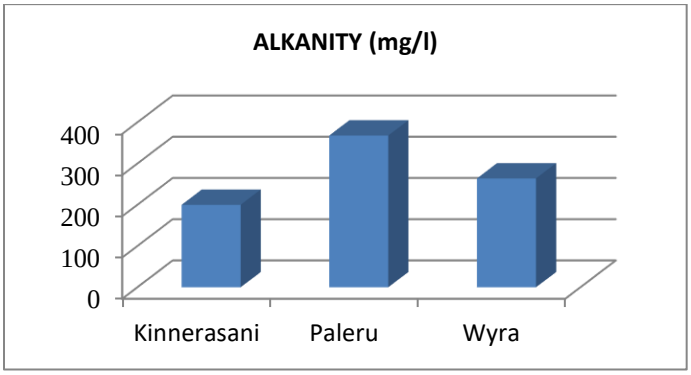

Figure 11 Comparison of variations of Alkalinity (mg/l) in three study reservoirs

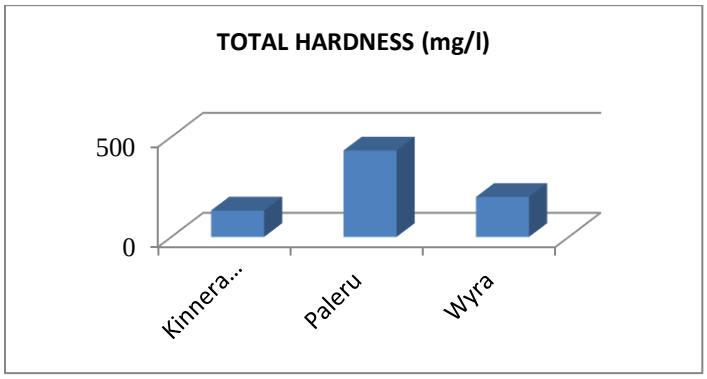

Figure 12 Comparison of variations of Total dissolved solids (mg/l) in three study reservoirs

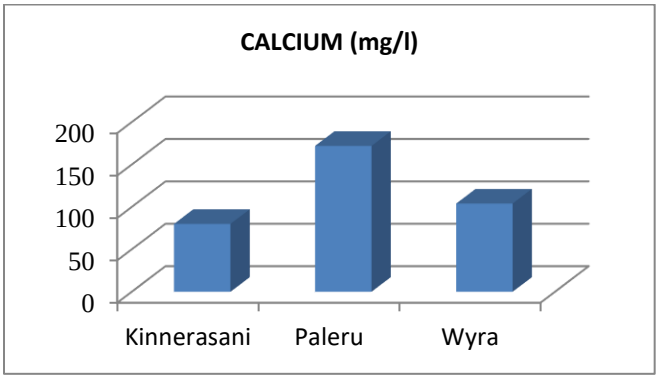

Figure 13 Comparison of variations of Calcium (mg/l) in three study reservoirs.

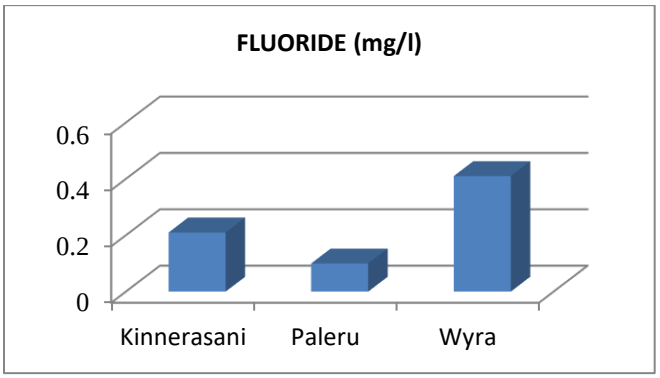

Figure 14 Comparison of variations of Fluorides (mg/l) in three study reservoirs

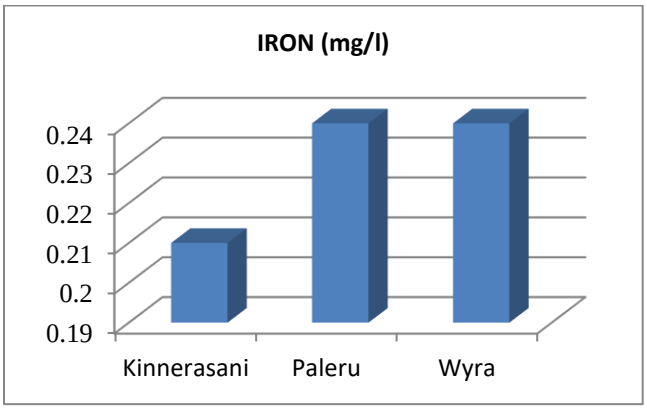

Figure 15 Comparison of variations of Iron (mg/l) in three study reservoirs.

4. CONCLUSION

The present study shows detailed report of Physico- chemical characteristics assessment of Kinnersani, Palair, Wyra reservoirs of Khammam. The study is analyzed 12 parameters of three reservoirs water which are essential to identify water quality of reservoirs, the water parameter results are compared with the standards of BIS, WHO. In overall Three reservoirs PH, Sulphates, Nitrates, Alkalinity, Total Hardness and Fluorides are within the limitations of BIS, WHO, but in this study Palair reservoir shows high ranges of results in Electrical Conductivity, Chlorides and Total dissolved solids these are more than standards of BIS, WHO. Wyra reservoir having high density in turbidity and both of Wyra and Palair reservoirs are having high ranges in Alkalinity, finally it was concluded that The Kinnersani reservoir results good and all are within the limitations of BIS and WHO.

Abbreviations

JETL (Jeedimetla effluent treatment plant),
BSI (Bureau of Indian standards),
WHO (World Health Organization)

Ethical approval

Not applicable.

Informed consent

Not applicable.

Conflicts of interests

The authors declare that there are no conflicts of interests.

Funding

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Data and materials availability

All data associated with this study are present in the paper.

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